

MOUNTAIN QUAIL TRANSLOCATIONS IN EASTERN OREGON

Project Report: 2002



**Greg Jackle, Field Technician
Oregon Department of Fish and Wildlife**

**Eric V. Rickerson¹, Upland Game Bird Manager
Oregon Department of Fish and Wildlife**

**Michael Pope², Faculty Research Associate
Oregon State University**

**Dave Zalunardo, Wildlife Biologist
Ochoco National Forest**

Contact Information: ¹ P.O. Box 59, Portland, Oregon 97207
503-872-5260 ext. 5597, email: eric.v.rickerson@state.or.us

² Department of Fisheries and Wildlife, 104 Nash Hall,
Oregon State University, Corvallis, OR 97331
541-737-4908 email: popem@onid.orst.edu

Executive Summary

Mountain Quail populations have declined in many areas of the western Great Basin, particularly across former ranges in southeastern Washington, western Idaho, and eastern Oregon. Strategies for restoring declining wildlife populations have been largely reactive with recovery programs typically initiated only after populations or suitable habitats reached critically low levels. Restoration plans were often implemented without a clear understanding of the life-history or habitat requirements of a species. Griffith et al. (1989) suggested conducting research and testing restoration techniques on species before populations reached crisis levels. Mountain Quail are an excellent candidate for translocations given the criteria proposed by Griffith et al. (1989). This species is highly productive with large clutches (10-12 eggs/clutch), and has a highly varied, mostly herbivorous diet. Currently, western Oregon has abundant and easily accessible populations of Mountain Quail that could be a source for re-establishing or supplementing populations in areas of eastern Oregon where populations are rare or have been extirpated.

In 2001, the Oregon Department of Fish and Wildlife, the U.S. Forest Service, and the Game Bird Program at Oregon State University initiated a Mountain Quail translocation and research program for eastern Oregon. The goal of this project was to implement a restoration plan for Mountain Quail in eastern Oregon based on translocations of Mountain Quail from western Oregon to former ranges in eastern Oregon. A critical component of this program was the post-release monitoring of radio-marked, translocated Mountain Quail. Data from the monitoring effort will be used to refine procedures for future translocations and to evaluate the success of translocations. In winter of 2001, 69 radio-marked birds and 47 banded but un-radioed birds were translocated to 3 sites near the south fork of the John Day River. In winter of 2002, 66 radio-marked birds were released in 2 of the 3 release sites used in 2001, and 27 birds (9 radio-marked, 18 banded) were released in the Maury Mountains near Prineville. This report summarizes data collected in 2002.

Ninety-three Mountain Quail captured in southwest Oregon were released in Cabin and Jackass Creeks in the Murderer's Creek Coordinated Resource Area and the Maury Mountains in north-central Oregon in winter 2002. Seventy-five of the 93 translocated quail were radio-marked and monitored until 30 July 2002. Of the 93 Mountain Quail, 27 (9 radio-marked) were released in the Maury Mountains on 22 January and 30 January. Sixty-six radio-marked birds were released in the Murderer's Creek Coordinated Resource Area (35 in Jackass and 31 in Cabin Creek) on 22 January, 30 January, and 13 March. Thirteen of 75 radio-marked quail lived until 30 July, 52 died, and 10 disappeared or their radio transmitters failed. The mean distance moved from release sites to breeding ranges was 5.8 km. Thirty-eight per cent of the quail that lived until the breeding season moved in a northwest direction from release sites to breeding ranges. Ten nests were located in Murderer's Creek Coordinated Resource Area and no nests were found in the Maury Mountains. Hatch year birds produced 9 of 10 nests, and males incubated 4 of the 10 nests. We had 1 radio-marked pair where both the male and female incubated separate clutches. The mean clutch size was 10.7 eggs and the mean hatch date was 20 June. Two of 10 nests were completely depredated. Eight of 10 nests were located in plant associations dominated by western juniper (*Juniperus occidentalis*), ponderosa pine (*Pinus ponderosa*) or Dougla-fir (*Pseudotsuga menziesii*).

Most nests were associated with moderate slopes ($<26^\circ$) and were on southwest or northeast facing slopes. Mean canopy closure at nests was 42%, and the mean distance to the nearest road was 906 m.

For 2003, 5 translocation sites will be selected in eastern Oregon with the projected release of 100 Mountain Quail at each site for a minimum of 3 years. Three of 5 sites will have post-release monitoring of ≥ 60 radio-marked birds. We propose to test 2 techniques for translocations in 2003. We will hold in enclosures 50% of the birds captured in southwest Oregon until early April, and then release these birds at the 3 monitored sites in eastern Oregon. For comparison, we will capture an equal number of birds in southwest Oregon in January-February, and immediately transport and release these birds at the same translocation sites. Comparisons of survival and reproductive success (nest initiation, hatch rates) at each site between the 2 sample populations will assist in developing more effective translocation techniques.

INTRODUCTION

Mountain Quail (*Oreortyx pictus*) are the largest of 6 species of New World quail in North America. They are secretive birds that inhabit a diverse range of habitats, but typically are associated with early seral, shrub vegetation. Males and females have identical plumage and size characteristics. Mountain Quail are the least studied of the New World quail in North America with much of the biological knowledge based on incomplete or anecdotal sources (Pope 2002).

Mountain Quail populations have declined in many areas of the western Great Basin during the past century (Brennan 1990, 1994, Vogel and Reese 1995, Gutiérrez and Delehanty 1999, Pope 2002). Their current geographic range extends south to the Baja Peninsula, north to Vancouver Island in British Columbia, and east to western Idaho and Nevada (Crawford 2000). Historically, there were accounts of Mountain Quail in every county in Oregon (Jobanek 1997). Currently, Mountain Quail are common in the Coast and Cascade Mountain Ranges of western Oregon, and are less common or have been extirpated in many areas east of the Cascade Mountain Range (Pope 2002).

The lack of information on Mountain Quail and their apparent decline in many areas of eastern Oregon prompted the Game Bird Research Program at Oregon State University (OSU) to initiate a research project on Mountain Quail ecology in 1996. This research compared the life history attributes (habitat selection, survival, reproduction, and movement patterns) of a sample population of Mountain Quail in southwestern Oregon in the lower Cascades where populations are stable and abundant with a resident population near Hell's Canyon in northeastern Oregon where Mountain Quail may be declining. An additional goal was to translocate a sample of Mountain Quail from southwestern Oregon

to northeastern Oregon, and compare the life history of these transplanted quail with the resident populations in Hell's Canyon and in the Cascades.

Results from this research were used to develop a Mountain Quail translocation and research plan for eastern Oregon (Pope et al. 2002) with translocations as a major pro-active component of this plan. The first phase of this translocation effort included the release of wild Mountain Quail (captured in the southwestern Cascades) into multiple sites in the John Day River Basin in north-central Oregon. The research objectives of the first phase were to monitor a radio-marked sample of quail released near the south fork of the John Day River to:

- 1) determine habitat use, survival, reproduction parameters, and movements of translocated quail,
- 2) to determine if translocated radio-marked Mountain Quail can be used to locate resident populations of Mountain Quail in eastern Oregon, and
- 3) to refine and evaluate protocols for future translocations and post-release monitoring procedures.

The first phase was initiated in the winter of 2001 with the translocation of 69 radio-marked birds and 47 banded but un-radioed birds to 3 sites near the south fork of the John Day River. In winter of 2002, 66 radio-collared birds were released in 2 of the 3 release sites used in 2001, and 27 birds (9 radio-collared, 18 banded) were released in the Maury Mountains near Prineville.

This report is a summary of the translocation field work completed in 2002. Included as part of the Appendix is a report on current and historic distributions of Mountain Quail in eastern Oregon. In 2001, the Oregon Department of Fish and Wildlife, the U.S. Forest Service, and the Game Bird Program at Oregon State University began a mapping effort to record Mountain Quail locations taken from survey forms sent to state, federal, and private organizations in 1996, 1998, and 2002. The primary objective of this work was to better understand current distributions of Mountain Quail in eastern Oregon.

A secondary objective was to review the literature to determine historic locations and distributions of Mountain Quail in eastern Oregon.

METHODS

STUDY AREA

For 2002, the two release sites selected near the south fork of the John Day River were located in Murderer's Creek Coordinated Resource Area (MCCRA) 10 km southeast of Dayville, Oregon. The release site in the Maury Mountains was located 32 km southeast of Prineville, Oregon. The 43,193 ha MCCRA (Figure 1) is jointly managed by the Bureau of Land Management (BLM) and the Oregon Department of Fish and Wildlife (ODFW), and includes the 9256 ha Phillip W. Schneider Wildlife Area managed by ODFW. The release site in the Maury Mountains was located on private land < 1 km from the Ochoco National Forest.

Historical records indicated heavy livestock use on the Murderer's Creek flats from 1912-1972, with public land permits allocating 50,000 AUM's compared with 6,000 today (ODFW, unpublished report). In 1972, ODFW purchased part of Murderer's Creek to provide winter range habitat for mule deer, control wildlife damage, and protect riparian zones. Current grazing practices combine high density, short duration grazing with a rest/rotation system.

Two sites in MCCRA, Jackass Creek and Cabin Creek, were selected as release locations based on vegetation complexity and diversity. Jackass Creek, a tributary of the south fork John Day River, has steep, rugged, slopes dominated by western juniper with diverse understory shrubs, dominated by mountain big sagebrush (*Artemisia tridentata* *vaseyana*) and bitterbrush (*Purshia tridentata*). Cabin Creek, a tributary of Murderer's

Creek, is characterized by gentle-sloped, grassy uplands dominated by western juniper and bitterbrush and riparian zones dominated by red alder (*Alnus rubra*) and willow (*Salix* spp.). Upland and ridge-top forests are dominated by stands of ponderosa pine, Douglas-fir, mountain mahogany (*Cerocarpus betuloides*), and grand fir (*Abies grandis*). Elevations range from 701m at canyon bottoms to 2130 m on the top of Aldrich Mountain. Temperatures averaged from a high of 81.2° C in July to a low of 1.8° C in January. Most of the moisture in this area falls in the form of snow, and the average annual moisture accumulation is 44 cm (Oregon State Climate Center, Oregon State University).

The Maury Mountains are located in central Oregon southeast of Prineville and are primarily composed of public lands managed by the Ochoco National Forest. Juniper woodland or juniper steppe plant associations cover 66% of the Maurys. Scabland grass plant associations cover 10% of the area, and Douglas-fir, grand fir or ponderosa pine associations cover 14% of the area. Elevations range from 945 m at valley bottoms to 1828 m at mountain peaks. Annual mean precipitation and temperatures are similar to MCCRA.

CAPTURE AND RADIO TELEMETRY

We captured Mountain Quail in January-February 2002 in southwestern Oregon using treadle traps baited with grain. A total of 93 birds were captured in Douglas County (Myrtle Creek) and Jackson County (Evans Creek). Captured birds were weighed, banded, identified by plumage as hatch year (HY) or after hatch year (AHY) (Leopold 1939), and blood was extracted for gender identification (PE AgGen, Davis, CA) from all birds selected for radio-marking. Additionally, blood was taken from 15 randomly selected birds for disease testing. Seventy-five birds were fitted with necklace-

style radio transmitters that weighted approximately 3.6 g (Model PD2C, Holohil System Ltd., Woodlawn Ontario, Canada). Sixty-six radio-marked birds were released at Cow and Jackass Creek in MCCRA. Nine radio-marked and 18 banded Mountain Quail were released in the Maury Mountains.

Mountain Quail with transmitters were relocated from time of release in late January to the last week in July. Telemetry methods included monitoring from fixed winged aircraft, mobile tracking by vehicle/ATV, and ground monitoring. Flights were generally monthly from January-March and bimonthly April-May. We recorded, for all ground-monitored radio-marked birds, location (UTM), habitat use (based on plant assemblages), associations with other radio-collared birds, and distance to road and water.

Nest sites were located by tracking and visually identifying radio-marked Mountain Quail that were incubating clutches. The birds were flushed off nests to count number of eggs, and we installed temperature-sensitive data-loggers (Model HOBO-pro, Onset Computer, Pocasset, MA) to determine nest attendance patterns. Data loggers measured nest temperatures with 0.2-cm thick thermistors placed under eggs, and ambient temperatures with monitors positioned <15 m from nest sites. All nests were flagged for later identification. Nests were checked and data collected from loggers once a week. We limited disturbance by observing birds from >8 m distances to confirm incubation. After hatch, eggshell membranes, shells, and unhatched eggs were counted to determine number of hatched chicks. Successful nests were defined as those in which ≥ 1 egg hatched and unsuccessful if abandoned or depredated and no eggs hatched. Adults and broods were monitored for 3 weeks after hatching to determine movement patterns.

NEST SITE AND RANDOM SITE CHARACTERISTICS

Protocols for nest-site sampling were derived from Pope's (2002) research on Mountain Quail. To limit disturbance, we conducted vegetation sampling in July after eggs had hatched. Two random sites for each nest were selected using random numbers to select azimuths ($^{\circ}$) and distances (≤ 500 m) from nest bowl. Nest site characteristics were defined by an 8-m radius plot (0.08 ha) centered on the nest. Twenty-one characteristics were recorded from the nests and random sites. Overstory (canopy closure) was measured with a convex spherical densiometer (Lemmon 1957) at nest center and at 4 points, 8 m from nest center in each of the cardinal directions (Pope 2002). Densiometer readings were averaged to estimate percent canopy coverage. Shrub composition and density were determined using line-intercept estimates (Canfield 1941), and ground-level characteristics were derived from 20-x 50-cm Daubenmire frames (Daubenmire 1959) centered on the nest and placed at 2 and 4 m points along 4, 8-m transects that radiated from the nest center in each of the cardinal directions (Pope 2002). Foliage height and cover was estimated from 220 cm Robel poles (Robel et al. 1970) placed 8m from nests in the 4 cardinal directions (Pope 2002). Elevation and distances to nearest road and water source was determined by Arcview GIS. All means reported in this summary are \pm SE.

BREEDING RANGE MOVEMENTS

Movements between release sites and breeding ranges were estimated by comparisons of the release site locations with the last breeding-range locations (Pope 2002). Winter range was defined as locations of radio-marked Mountain Quail from 1 January-30, and breeding range as locations after 1 May.

RESULTS

CAPTURE AND RELEASES

Ninety-three Mountain Quail captured in southwest Oregon were released at 3 separate sites in north-central Oregon on 3 different dates. The first releases occurred on 22 January in the Maury Mountains and MCCRA areas with 16 (4 radio-marked and 12 banded) birds released in the Maurys and 41 (all radio-marked; 10 Jackass Creek, 31 Cabin Creek) released at MCCRA. The second release occurred on 30 January with 11 (5 radio-marked and 6 non-radioed but banded) birds released in the Maury Mountains and 5 radio-marked birds released in Jackass Creek in MCCRA. The third release occurred 13 March with 20 radio-marked birds released in Jackass Creek.

Sixty-six birds were released in MCCRA and 27 in the Maury Mountains. Nine of 27 (33%) birds released in the Maurys were radio-marked and all (66) MCCRA birds were radio-marked. Of the 75 radio-marked birds, 38 (51%) were males, 31 (41%) were females, and 6 (8%) were of unknown gender. Of the 93 translocated birds, 66 (71%) were HY (hatch year) and 27 (29%) were AHY (after hatch year)(Table 1).

Table 1. Gender and age of translocated Mountain Quail released in 2 locations in Murderer's Creek Coordinated Resource Area and 1 location in the Maury Mountains of north-central Oregon, winter 2002.

Release Location	Total	Male/Female	HY/AHY¹
Jackass Creek (MCCRA)	35	19/16 ²	27/8
Cabin Creek (MCCRA)	31	16/14	23/8
Maury Mountains	27	5/2	16/11
Total	93	40/32	66/27

¹ HY= hatch year or juvenile quail, AHY= after hatch or adult birds.

² Gender identification unknown for 6 radio-marked birds, and (except for 3 birds) all quail released without radio transmitters were not tested for gender identification.

SURVIVAL

We determined survival for only the radio-marked translocated quail (Table 2). Thirteen of 75 (17%) Mountain Quail lived until the end (30 July) of the study, 52 (69%) died, and 10 (13%) disappeared or their transmitters failed prematurely. Twelve of 54 (22%) HY quail lived, 34 (63%) died, and 8 (15%) disappeared. One of 21 (5%) AHY Mountain Quail lived, 18 (86%) died, and 2 (10%) disappeared. Eight of 38 (21%) males survived until the end of the study, 22 (58%) died, and 8 (21%) disappeared or their transmitters failed prematurely. Four of 31 (13%) females lived, 24 (77%) died, and 3 (10%) disappeared or their transmitters failed. Of the radio-marked quail released at Jackass Creek in MCCRA, 7 of 35 (20%) survived, 22 (63%) died and 6 (17%) disappeared or their radios failed. Of the Mountain Quail released at Cabin Creek, 6 of 31 (19%) lived, 21 (68%) died, and 4 (13%) disappeared or their transmitters failed. For the Maury Mountains, 8 of 9 (89%) quail died, and 1 disappeared or its transmitter failed. Seven of 44 (16%) birds survived from the 22 January release, 3 of 10 (30%) lived from the 29 January release, and 3 of 20 (15%) from the 12 March release survived until the end of the study.

Table 2. Proportion of radio-marked translocated quail by age, gender, release date, and location that survived in the Maury Mountains and Murderer's Creek Coordinated Resource Area in north-central Oregon, winter-summer 2002.

Category	% Survived			
	All Releases	Release Date		
		22 January	29 January	12 March
HY	0.23	0.18	0.50	0.21
AHY	0.05	0.10	0.00	0.00
Males	0.21	0.14	0.40	0.33
Females	0.13	0.16	0.25	0.00
Jackass Crk.	0.20	0.10	0.60	0.15
Cabin Crk.	0.19	0.19		
Maury Mtn.	0.00	0.00	0.00	

BREEDING RANGE MOVEMENTS

Seventeen quail (10 females, 6 males, and 1 bird of unknown sex) survived until or after 1 May and were included in our summary of breeding range movements. The mean distance from release sites to breeding ranges was 5753 ± 1194 m (range 194-14626). The average distance that females moved to breeding ranges was 6285 ± 847 m (range 194 – 13936), and the average distance that males moved was 5091 ± 1950 m (range 2004 – 14626). Six of 17 (35%) birds moved in a northwest direction (between 270 and 360°) from release sites to breeding ranges, 4 (24%) moved in a southwest (180-270°) direction, 4 (24%) in a southeast (90 - 180°) direction, and 3 (18%) moved in northeast (0 - 90°) direction. Five of 10 (50%) females moved in a northwest direction, 3 (30%) moved southeast from release sites, and 3 of 6 (50%) males moved in a southwest direction.

Eight quail moved down in elevation in migrating to breeding ranges from release sites with an average decline in elevation of 176 ± 48 m (range 31 – 343), 8 moved

higher in elevation with a mean increase of 232 ± 76 m (14 – 602), and 1 bird remained at the same elevation. Five females moved higher in elevation with a mean rise of 321 ± 112 m (range 14 – 395) and 4 moved down in elevation with an average decline of 215 ± 51 m (34 – 343). Three males moved higher in elevation with a mean increase of 188 ± 85 m (range 13- 419) and 3 moved down in elevation with an average decrease of 162 ± 70 m (range 31- 355). One bird of unknown sex moved 62 m down in migrating to its breeding range.

REPRODUCTIVE AND NEST SITE CHARACTERISTICS

Reproductive Characteristic

During late May and early June 2002, 10 nests of radio-marked translocated quail were located in MCCRA in north-central Oregon (Table 3). No nests were located for Mountain Quail released in the Maury Mountains. Of the 10 nests, 7 were produced by quail released during the first release on 22 January and 3 were from birds released on 29 January. We found no nests for birds released on 13 March. Five nests were incubated exclusively by females, 4 by males, and 1 by a bird of unknown gender. Nine of 10 birds that incubated clutches were HY. Mean clutch size was 10.7 ± 0.6 eggs (range 8-14) with a total of 107 eggs produced. Mean clutch size for males was 12 ± 0.9 eggs (range 10-14) and for females 10.2 ± 0.5 eggs (range 9-12). We had 1 radio-marked pair, and both the female and male incubated separate clutches for a total production by the female of 20 eggs (10 for female's nest and 10 for male's nest.) Eight of 10 (80%) nests successfully hatched eggs, 2 nests (female incubated) were completely depredated, and 2 of 8 successful nests were partially depredated but hatched chicks. A male remained on his clutch until only 1 egg remained (all others were depredated) and finally abandoned his nest after the last egg was lost. Mean hatch size ($n = 8$) was 8 ± 1.1 eggs (range 4-

14). For males, mean hatch size was 9.5 ± 1.9 chicks (range 5–14) and for females 7.3 ± 0.7 chicks (range 6–8). Fifteen of 79 (19%) of eggs that remained in nests until the completion of incubation were infertile or did not hatch. Mean hatch date was 22 June (range 16 June–2 July). Mean hatch date for male incubated nests was 20 June (range 16 June–24 June) and 25 June (range 20 June–2 July) for female incubated nests.

Table 3. Clutch and hatch size, fate, and hatch dates of translocated Mountain Quail nests located in north-central Oregon, spring and summer 2002.

Band #	Gender	Age ¹	Clutch size	Hatch size	Fate ²	Hatch Date
4	Female	AHY	10	8	S	6/23
11	Female	HY	10	6	S	7/2
17	Female	HY	12	8	S	6/20
20	Male	HY	13	11	S	6/16
25	Female	HY	9	0	U	
36	Male	HY	11	8	S	6/24
56	Unknown	HY	8	4	S	6/25
95	Male	HY	14	14	S	6/20
97 ³	Female	HY	10	0	U	
99 ³	Male	HY	10	4	S	6/21
Average			10.7	8		6/22

¹ HY = hatch year birds and AHY = adult or after hatch year.

² S denotes successful or nests that hatched ≥ 1 egg(s) and U are nests that hatched no eggs.

³ Radio-marked pair.

Nest Site Characteristics

Five nests were located in western juniper plant associations; 3 in JUOC/FEID-AGSP, 1 in JUOC/ARTRC/FEID-AGSP, and 1 in JUOC/PUTR-AGSP (Table 4). Two nests were located in mountain big sage/Idaho fescue plant associations (ARTRV/FEID-AGSP), 2 in ponderosa pine dominated plant associations (PIPO/CELE/FEID-AGSP and PIPO/CELE/CAGE), and 1 in Douglas-fir/common snowberry (PSME/SYAL) plant associations.

Table 4. Plant associations identified with nest site locations of translocated Mountain Quail in north-central Oregon, spring and summer 2002.

Plant Associations	ID code
Ponderosa pine/Mt. mahogany/ID-fescue-bluebunch wheatgrass	PIPO/CELE/FEID-AGSP
Ponderosa pine/Mt. mahogany/elk sedge	PIPO/CELE/CAGE
Mountain big sagebrush/ID-fescue-bluebunch wheatgrass	ARTRV/FEID-AGSP
Douglas fir/common snowberry	PSME/SYAL
Juniper/ID-fescue-bluebunch wheatgrass	JUOC/FEID-AGSP
Juniper/Mt. Big sagebrush/ID-fescue-bluebunch wheatgrass	JUOC/ARTRV/FEID-AGSP
Juniper/bitterbrush/ID-fescue-bluebunch wheatgrass	JUOC/PUTR/FEID-AGSP

The mean width of nest bowls was 16 ± 0.6 cm (range 13 – 20) and the mean depth was 6 ± 0.5 cm (range 3 – 6). The mean distance of nest sites to release sites was 4.9 ± 1.7 km (range 0.6 – 14), and 5 of 10 (50%) nests were located northeast (1-90°) of release sites. Three nests were southeast of release sites and 2 located northwest of release areas. Five of 10 (50%) nests were located on southwest facing slopes, 2 on northeast, 2 on northwest, and 1 on southeast aspects. Most nests were positioned on the top 1/3 of canyon ridges. The mean elevation of nests was 1279 ± 91 m (range 813 – 1730) and average slope was $26 \pm 2.1^\circ$ (range 20 – 40). The average distance of nests to water was 268 ± 75 m (range 5 – 586) and the average distance to the nearest road was 906 ± 354 m (range 22 – 3107) (see Table 5: for comparison with nest site characteristics collected from 1997-2000 for Hell's Canyon and the lower Cascades).

In nest plots at MCCRA, mean canopy closure was $42 \pm 0.06\%$ (range 11 – 78), the average shrub cover in plots was $14 \pm 0.05\%$ (range 1 – 47), and grass, down wood or litter compose the greatest proportion of ground cover (Table 5). For plots that contained trees, the dominant species was western juniper or ponderosa pine and the mean height of trees in plots was 4 ± 0.5 m (range 2.5 – 5.1). Generally, nests were

embedded in grass clumps, or between rocks or under down wood, and were well-concealed.

Table 5. Mountain Quail nest site ($n = 67$) characteristics in 8-m radius plots for John Day area of north-central Oregon, the lower Cascades in southwest Oregon, and Hell's Canyon National Recreation (HCNRA) in northeast Oregon, spring and summer 1997-2002.

Nest Site Variables	John Day ($n = 10$)		Cascades ($n = 23$)		HCNRA ($n = 34$)	
	Mean	SE	Mean	SE	Mean	SE
Distance road (m)	906	355	78	22	716	153
Distance water (m)	269	75	286	43	124	28
Canopy closure (%)	42	7	52	6	48	4
Slope (degrees)	26	2.20	26	2.62	31	2.61
Elevation (m)	1279	91	799	66	1086	66
Proportion of ground-level shrubs (Daubenmire frames)	0.07	0.03	0.22	0.03	0.21	0.03
Proportion of grass	0.15	0.02	0.09	0.02	0.19	0.02
Proportion of wood	0.11	0.03	0.19	0.03	0.08	0.01
Proportion litter	0.16	0.03	0.41	0.05	0.25	0.03
Height perimeter vegetation (cm)	70	14	136	13	108	10
Proportion of plot composed of shrubs (Canfield line-intersect)	0.14	0.05	0.28	0.03	0.29	0.03
Height shortest shrub (cm)}	39	10	23	10	36	4
Height tallest shrub (cm)}	57	12	140	16	119	11

DISCUSSION

Survival rates for Mountain Quail are poorly documented. Little data are available that describe mortality for native or translocated populations of Mountain Quail. The continued decline of Mountain Quail in many areas of the western Great Basin make accurate estimates of survival critical for restoration planning and management. Mortality for translocated Mountain Quail released in north-central Oregon near the south fork of the John Day River in 2002 was higher (69% died in north-central vs 50-55% for Hell's Canyon and Lower Cascades) than for translocated and native quail in Hell's

Canyon and the lower Cascades reported by Pope (2002). We were unable to accurately estimate cause-specific factors for mortality, but most of our mortality sites for all populations and areas appeared to be pluck sites, indicative of avian (raptor) depredations. During 2002, several snow storms that occurred shortly before and after the releases in the John Day River Basin may have increased the exposure of the translocated quail to raptor predation and inflated the mortality rates. Similar to Hell's Canyon and the lower Cascades, the likelihood of survival for translocated Mountain Quail in the north-central Oregon was greater for males than for females. Translocated Mountain Quail released in mid-March did not appear to have higher survival than birds released in late January. Accurate estimates of survival are essential for developing translocation strategies for restoration plans. Without knowledge of mortality of translocated birds, the success or lack of success of reintroductions as a restoration technique cannot be adequately evaluated.

Similar to Pope's (2002) report on translocated Mountain Quail in Hell's Canyon, translocated quail in north-central Oregon moved considerable distances to breeding ranges, and these movement patterns were displayed by both females and males, and for birds released at different sites. However, unlike the Hell's Canyon translocated birds, Mountain Quail in north-central Oregon did not exhibit a pattern in the directionality of their movements. This difference in directionality between the 2 studies may be related to differences in the capture locations. Additionally, translocated birds in north-central Oregon did not display a preference for migrating to higher elevation sites when moving to breeding ranges as displayed by translocated birds in Hell's Canyon and native birds in the lower Cascades of southwest Oregon. Translocated birds in north-central Oregon were released at higher elevations than translocated quail in Hell's Canyon and this factor

may account for the lack of elevational change noted for birds released in the north-central Oregon.

Reproductive characteristics were similar for the translocated quail released in north-central Oregon and Hell's Canyon, and the native quail in Hell's Canyon and the lower Cascades. Clutch and hatch sizes were similar. Sample size constraints did not allow for rigorous statistical comparisons between the 2 studies, but many of the reproductive trends observed in north-central Oregon were comparable with Pope's (2002) study. Males actively incubated clutches and brooded their chicks without assistance from their mates. We had 1 radio-marked pair where the female produced 2 simultaneous clutches. Mountain Quail from both studies demonstrated a reluctance to abandon nests even after partial nest depredations. Also, a number of nests from both studies had infertile or unhatched eggs. Only 2 of 10 (20%) nests in MCCRA Oregon were completely depredated, an indication that the potential for nest loss may be less for translocated birds MCCRA than for Hell's Canyon. Similar to Hell's Canyon and the Cascade Mountain study areas, male incubated clutches in north-central Oregon hatched earlier than female clutches.

Nests in MCCRA were generally further from roads and water than in Hell's Canyon. Nests plots in MCCRA had less canopy cover, lower shrub height, and less ground shrubs than nests in the lower Cascades or Hell's Canyon. However, the proportion of grass within plots was similar to Hell's Canyon. MCCRA nests were generally located at higher elevations than Hell's Canyon or the lower Cascades. For 3rd order selection of nest areas, nests located in MCCRA generally were in more open plant associations that had some conifer component (e.g., western juniper). Similar to many

nests in Hell's Canyon, nest sites in MCCRA were often located in grass clumps or near overhanging rocks.

MANAGEMENT IMPLICATIONS

Translocations of wildlife to supplement or re-establish populations of native species have become an important and broadly accepted conservation technique (Griffiths et al. 1996). A survey of translocation programs estimated that nearly 90% of approximately 700 translocations between 1973 and 1986 were game species, and gallinaceous birds accounted for a significant proportion (43%) of these translocation efforts (Griffiths et al. 1989). Few translocation efforts incorporated post-release monitoring that evaluated the effectiveness of the program or compared survival of translocated populations (Griffith et al. 1989). Game farm or pen-raised animals are usually less successful than wild birds as a source for translocations (Fellers and Drost 1995). A primary goal of this research was to coordinate management objectives with research to develop an effective and successful restoration program for Mountain Quail in eastern Oregon. Translocation programs will not succeed unless some measures of success are established and subject to evaluation. Post-release monitoring of radio-marked animals is one of the most effective methods of evaluating success.

Translocated Mountain Quail in north-central Oregon were successful in establishing nest sites, selecting mates, and producing chicks. However, in 2002 survival of translocated quail in north-central Oregon was lower than reported for translocated birds in Hell's Canyon or for native birds in Hell's Canyon and the lower Cascades of southwestern Oregon. We suspect the higher mortality in north-central Oregon may be related to snow storms that occurred before and after the first release.

For 2003, we propose to test different release procedures for at least 3 monitored translocation sites in eastern Oregon. One technique will include holding birds over-winter and releasing them in mid-April at 3 monitored translocation sites in eastern Oregon. The other technique will involve capturing Mountain Quail in late winter and immediately transporting captive birds to the same monitored translocated sites. We propose to radio-mark ≥ 60 birds for post-release monitoring at each site. Comparisons of survival and reproductive success between the 2 translocated sample populations at each site will allow for an effective evaluation of different release techniques. An on-going review of release procedures is essential to developing the most effective protocols for translocations and insuring that the maximum numbers of birds survive until the breeding season.

ACKNOWLEDGEMENTS

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COOPERATORS

Oregon Department of Fish and Wildlife
 Game Bird Research Program-Oregon State University
 U.S. Forest Service-Ochoco National Forest
 Quail Unlimited and Oregon Hunter's Association
 National Fish and Wildlife Foundation

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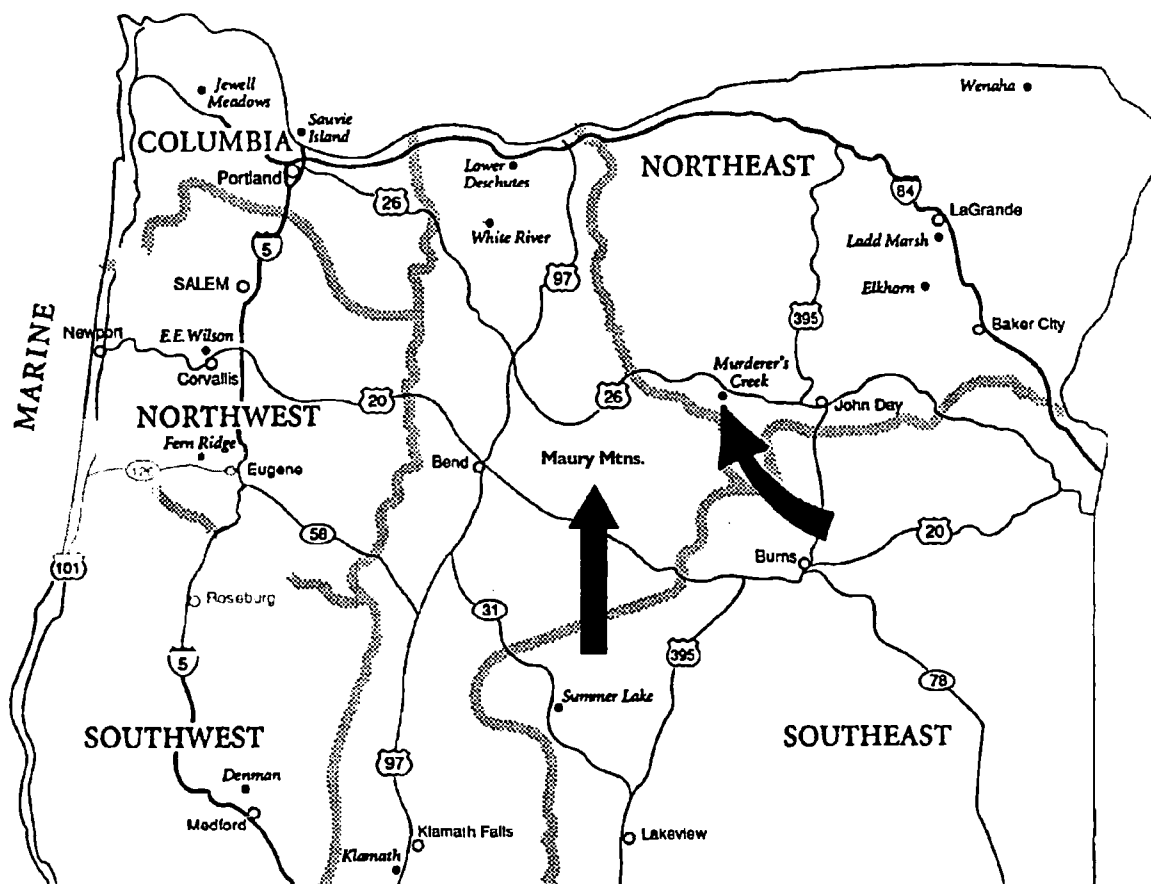


Figure 1. Mountain Quail translocation release sites in Murderer's Creek Coordinated Resource Area (MCCRA) and the Maury Mountains in north-central Oregon, winter 2002.

APPENDIX I

HISTORIC AND CURRENT DISTRIBUTIONS OF MOUNTAIN QUAIL IN EASTERN OREGON

(Prepared with assistance from Nolan Lewis, Game Bird Program, Oregon State University)

INTRODUCTION

Mountain Quail (*Oreortyx pictus*) occupy brushy habitats in much of the Western Great Basin of North America (Guitierrez and Delehanty 1999). Currently, Mountain Quail are abundant in western Oregon. However, populations in eastern Oregon have declined and perhaps <50% of their historic range is currently occupied (Vogel and Reese 1995). Of the 6 species of New World Quail in North America, Mountain Quail are the least known (Pope 2002). Information on current and historic distributions of Mountain Quail in Oregon has not been clearly defined.

In spring 2000, a petition to list Mountain Quail populations in the Snake River Basin under the Endangered Species Act was submitted to the U.S. Fish and Wildlife Service (Eric Rickerson, Upland Game Bird Manager, Oregon Department of Fish and Wildlife, personnel communication). Without a clearer understanding of historic and current distributions, the ability to adequately address this petition is in question.

The goal of this paper was to describe the historic and current distribution of Mountain Quail in Oregon. We had three specific objectives given the above goal. The first objective was to research the historic literature on Mountain Quail to determine historic locations in eastern Oregon. The second was to determine current distributions based on survey data collected by Oregon State University and the Oregon Department of Fish and Wildlife. The final objective was to propose protocols for developing a baseline map of current observations.

METHODS AND RESULTS

Historic distributions were determined from a literature search of published and unpublished (eg., interagency reports) references on Mountain Quail. Additionally we reviewed Jobanek's (1997) An Annotated Bibliography of Oregon Bird Literature Published Before 1935 and traced references to Mountain Quail listed in this text to original sources. Many of these sources referred to place names (eg., ranches, towns, creeks etc.) and dates.

For a review of current distributions of Mountain Quail, we relied on 3 surveys (1989, 1994, and 1998) of Mountain Quail locations in eastern Oregon. The 1st survey (1989) was conducted informally within the Oregon Department of Fish and Wildlife by Vic Coggins, district wildlife biologist. The 1994 and 1998 surveys were implemented by the Game Bird Program at Oregon State University (OSU). The OSU surveys consisted of observation reports sent to state and federal biologists, hunter groups, and birding organizations (Figure 1).

HISTORIC DISTRIBUTION

The first recorded information on Mountain Quail was of a specimen collected in 1806 by Reubin Field, a member of the Lewis and Clark expedition (Burroughs 1961). Two Mountain Quail were collected near Rooster Rock State Park, Multnomah County on the return journey down the Columbia. In 1826, David Douglas collected 2 Mountain Quail near Elkton, Douglas County (Jobanek 1997). Additionally, Douglas (1829) obtained a specimen collected by a hunter in Wasco County, east of the Cascades. He commented that Mountain Quail populations extended north to approximately the 45° latitude (Douglas 1829). J. K. Townsend reported that Mountain Quail were found in the

drainages of the Columbia and Willamette Rivers and south to California (Audubon 1844, Crawford 2000).

Crawford (2000) concluded that, historically in Oregon, Mountain Quail populations were found in the Coast Ranges of western Oregon, northward to the Columbia River and east to the western Cascade Mountains. Translocations began as early as 1860 (Crawford 2000) and occurred in Alabama, Oregon, Idaho, Washington, New Zealand, and British Columbia (Crawford 2000). These translocations, combined with natural movement patterns, may have accounted for more recent (post 1900) distributions of Mountain Quail in many parts of eastern Oregon. Anthony (1912) described how Mountain Quail have extended their range 125 miles into southwest Idaho.

Merrill (1888) mentioned that Mountain Quail were found near Fort Klamath in Klamath County and that the numbers and range of this species were increasing. A brief notice of C. E. Bendire's death in the *Oölogist* (14:36 1897) reported that he had collected Mountain Quail eggs near Malheur Lake in Harney County. A 1915 *Oregon Sportsman* (Anon. 3:209) article reported that 140 Mountain Quail (4 coveys) wintered near Silver Lake in Lake County, and described that several individuals were known to be nesting in the surrounding areas the following spring. The article also reported that Mountain Quail were observed around the Summer Lake Valley (also in Lake County).

Finley (1915) commented that Mountain Quail were found in considerable numbers in Harney and Malheur counties, and Fawcett (1914) reported on observations of large coveys of Mountain Quail on the Alvord Ranch, southeast of Steen's Mountain in Harney County. Anthony (1911) observed 12 Mountain Quail feeding near the town of Vale and Wyman (1912) also noted the occurrence of Mountain Quail at Vale. He expressed surprise at finding Mountain Quail in Vale because the nearest "home" was

thought to be approximately 75 miles west. In a subsequent article Anthony (1912) believed that the species was extending their range eastward and could often be found nesting in Bully Creek, a tributary of the Malheur River. He noted that Mountain Quail were known to be at Willow Creek near Ironside, at the base of the Burnt River Mountains and were common at Skull springs some 50 miles south and west of Vale. Anthony concluded that Mountain Quail existed in several tributaries of the Malheur River and were generally distributed over a considerable part of eastern Oregon.

In 1915 *The Oregon Sportsman* (Anon. 4:134-135) described 24 Mountain Quail that were liberated in Crook County. Jobanek (1997) suggested this report may have included Jefferson and Deschutes Counties. Mountain Quail were also present in Umatilla County in the early 1900s. In 1916, Umatilla County Game Warden, George Tonkin (1916), remarked on Mountain Quail found in Umatilla County as noted in 2 articles in *The Oregon Sportsman*. He remarked on their abundance (1916:4:53) and ability to withstand hard winters (1916:4:152-153)

Fermin Warnock reminisced about viewing Mountain Quail near the Imnaha in 1910 (Vic Coggins, Oregon Department of Fish and Wildlife, personnel communication). In 1926, *The Oregon Sportsman* reported that Mountain quail were plentiful in Wallowa County {Jewett 2(3):22}. Jewett (1926) commented that the Imnaha and Snake rivers had abundant populations of Mountain Quail, and believed they were more plentiful in this area than "anywhere else in the state of Oregon", but Gabrielson (1924) suggested these populations likely originated from translocated birds .

In Grant County, Hazeltine (1916) thought that Mountain Quail, introduced to the area a few years before, outnumbered all other game birds in the area, including abundant populations of blue and ruffed grouse.

The archaeological evidence of Mountain Quail is limited. Jefferson et al. (2002) lists Mountain Quail as part of the Wilson Butte Cave remains in Jerome County dated from 33,250-14,500 BP and Rudolph (1995) reported on Mountain Quail bones found at a pre-historic site located in the Weiser Valley in western Idaho near the Snake River. A pictograph dated 800 to 1000 years ago found in Jerome County has some resemblance to Mountain Quail with vertical side barring, a thick bill, and head plume (Murphey 1991). Gruhn (1961) reported on Mountain Quail bones excavated from Jerome County in western Idaho was dated to within the past 700 years.

CURRENT DISTRIBUTION IN EASTERN OREGON

Gabrielson and Jewett (1940) reported that Mountain Quail were found throughout much of eastern Oregon, but were most common in Crook, Jefferson, Klamath, Lake, Wasco, and Wallowa Counties. Masson and Mace (1970) commented that Baker and Malheur Counties had large populations of Mountain Quail. However, in 1989, Humphreys (ODFW, personnel communication) remarked that Mountain Quail were rare or absent from Baker County, and that the last confirmed observation he recorded was in the late seventies near Balm Creek with unconfirmed locations in Oxbow and McClain Creek in 1987. In Umatilla County, the Oregon Department of Fish and Wildlife observed no birds along brood routes from 1974-1989 (Vic Coggins, Oregon Department of Fish and Wildlife, personnel communication). In the 1980s and 90s, Mountain Quail have become rare or absent from most of Malheur County. During the 1950s, Mountain Quail were observed along lower Calf Creek, the Owyhee Reservoir, Pole Creek, and Succor Creek (Coggins 1989 unpublished survey) in Malheur County. Cecil Langdon (Oregon Department of Fish and Wildlife, retired) reported >1500 Mountain Quail along Cow Creek north of Jordan Valley in Malheur County during the

early 1950s but claimed they disappeared the next year. Also, in Malheur County, Mountain Quail were seen along Krumbo, Bridge, and Mud Creek canyons and west of Highway 205 north of Frenchglen in the 1970s, and in Malheur National Wildlife Refuge in the winter of 1970-1 (Marty St. Louis, Oregon Department of Fish and Wildlife, and Guy Sheeter, Bureau of Land Management, personnel communication). Mountain Quail have disappeared from most areas of Lake County. They were observed in the 1950's on Hart Mountain National Wildlife Refuge in Lake County but have not been observed on the refuge since (Jenny Barnett, U.S. Fish and Wildlife Service, personnel communication). Mountain Quail were observed in 1990 in Crane Creek, 6 miles south of Lakeview and in the winter of 1993 feeding near a logging dock in Lakeview (Lake County), but have not been seen near Lakeview since that observation (Larry Conn and Craig Foster, Oregon Department of Fish and Wildlife, personnel communication).

Of 225 observation forms returned between 1995 and 2001 for eastern Oregon, 176 (78%) were from 5 counties (Crook, Grant, Jefferson, Klamath, and Wasco) (Figure 2). Additionally, 14 (6%) were from Wallowa County and 14 (6%) from Wheeler County. Nine (4%) were from Malheur County. Four observations were from Union County, 3 from Umatilla County and 2 from Morrow County. Baker, Harney, and Sherman Counties had 1 observation each. Interestingly, of 9 observations from Malheur County, 1 was from the Owyhee Canyons and 1 from Succor Creek, areas identified as having Mountain Quail in the 1950s. The majority of the observations in Grant and Crook Counties were on the Umatilla, Malheur, and Ochooco National Forests. Most of the locations from the 3 counties (Crook, Grant, Jefferson) with most of locations were associated with the John Day River and Crooked River or their tributaries. The Harney County observation was from the northeast corner of the county on the Malheur National

Forest. The 2 observations from Morrow County were from the southcentral part of the county bordering the Umatilla National Forest, and the 1 observation from Sherman County was from the southeastern part of the county near the border of Jefferson County. In Wallowa County, most of the observations were associated with the Imnaha River in the eastern part of the County adjacent to Hell's Canyon National Recreational Area.

Currently, few eastern Oregon counties have abundant populations (Table 1). Mountain Quail are rare or have been extirpated from many areas in southeastern Oregon particularly former ranges in Harney, Lake, and Malheur Counties. They also appear to be rare or in low numbers in Baker and Union Counties in northeastern Oregon and in Sherman, Gilliam, Morrow, and Umatilla Counties. However, 3 counties (Jefferson, Crook, and Grant) with substantial National Forest and Bureau of Land Management lands adjacent the John Day River appear have considerable and potentially expanding population of Mountain Quail. Wallowa County populations are confined to the Imnaha River and its tributaries, but appear also have a reasonably stable and potentially expanding population of quail.

Brennan (1994) suggested that in the western Great Basin declines of Mountain Quail may be attributed to loss of habitat due to water impoundments, over-grazing, agricultural developments or extensive logging. Other factors that may have caused population declines are changes in fire regimes. Like most New World Quail, Mountain Quail are associated with early successional vegetation that generally results from disturbance. Historically, fires, both naturally caused and set by Native-Americans, were the single greatest influence that created and perpetuated plant communities (Franklin and Dyrness 1973). Intense fire suppression parallels the shrinking distribution of Mountain Quail populations (Pope and Heekin 1997).

MAPPING DATABASE

Mapping historic locations will be problematic because of the lack of specific locations. If possible place names should be used to delineate historic locations on a baseline map of historic distributions. Otherwise entire counties may have to be specified as historic ranges.

Current Mountain Quail locations should be mapped as accurately as possible by using Universal Transverse Mercator system coordinates. If place names (eg., creeks, mileage from nearest town etc) are the only locations given than an effort should be made to locate the source of the observation and confirm the location site. Survey forms and cover letters should be sent to state and federal biologists, hunter and birding groups every 2 years. Mapping of location sites should be occupied by county boundaries, major rivers and stream systems, and nearest town as reference points. Database fields should include DATE (M/D/Y), OBSERVER (OBS), COUNTY, XUTM, YUTM, NEAREST LANDMARK (LANDM), TOWNSHIP COORDINATES (TRS), HABITAT (HAB), QUAD MAP (QUAD), and a NOTES section. Maps should be updated and edited yearly.

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Mountain Quail Observation Report

Date of Report: _____ **Date of Observation:** _____

Observer(s): _____

Address: _____

Phone: _____ **Affiliation(BLM, USFS, ODFW,
 Private):** _____

County of Observation: _____

Nearest Landmark (stream, road, town name): _____

Township (Range and Section if known): _____

Description of Habitat (e.g., mixed conifer, conifer/shrub, riparian, residential etc.):

Number of Birds in Covey(s): _____

Comments: _____

Please forward report to: **Michael Pope**
Department of Fisheries and Wildlife
Nash 104
Oregon State University
Corvallis, OR 97331-3803
(541) 737-4908
Email:popem@onid.orst.edu

Figure 1. An example of an observation report form used in the 1994 and 1998 surveys to determine Mountain Quail distributions in eastern Oregon.

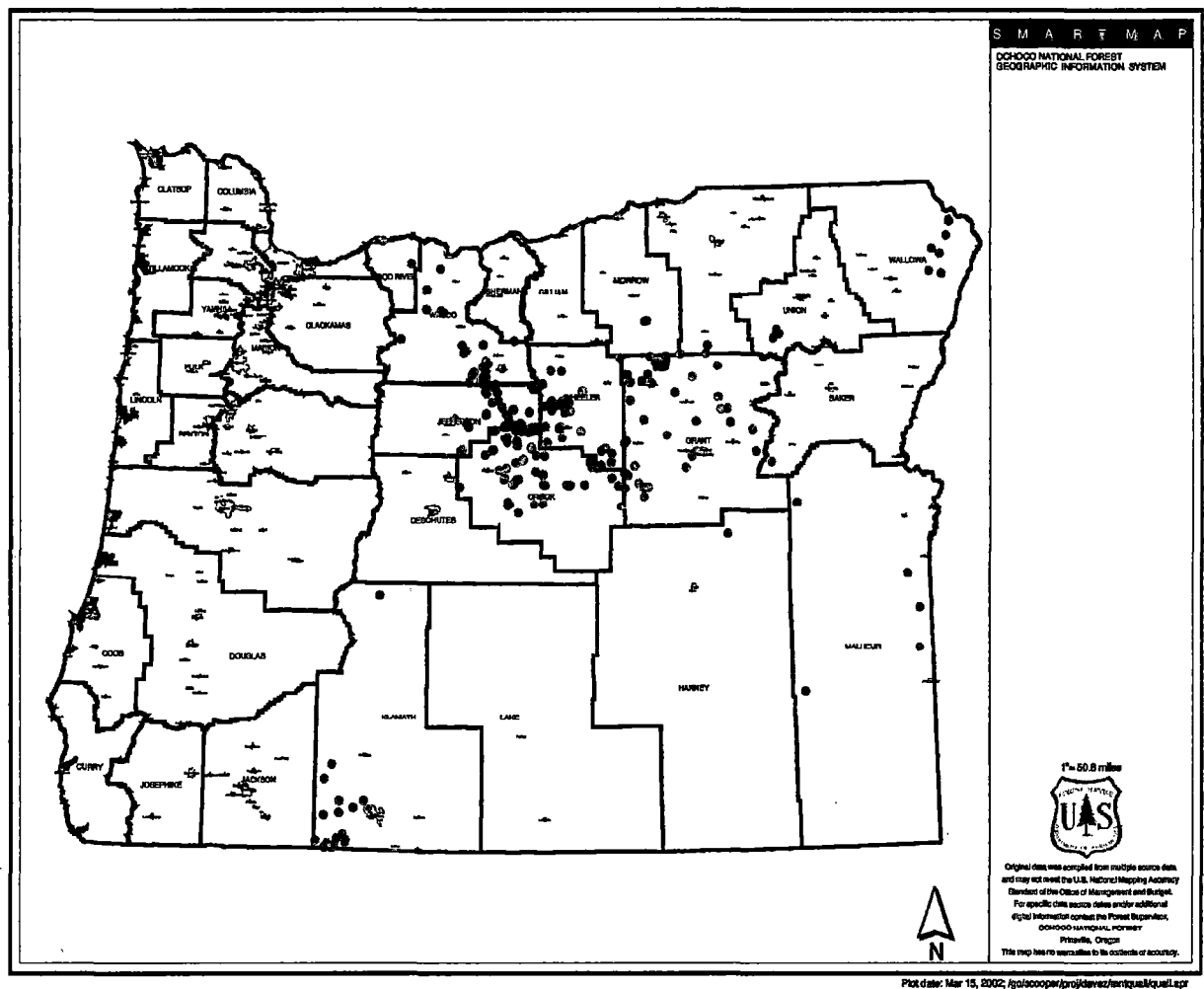


Figure 2. Map of Mountain Quail locations ($n=225$) in eastern Oregon developed from survey forms returned from 1994-2001 (Courtesy of Ochoco National Forest).

Table 1. Historic and current estimated relative abundance of Mountain Quail by county in eastern Oregon.

COUNTY	HISTORIC	CURRENT
Baker	L	R
Crook	M	M
Deschutes	M	M
Gilliam	L	R
Grant	M	M
Harney	M	A
Jefferson	M	M
Klamath	M	M
Lake	M	A
Malheur	M	R
Morrow	L	R
Sherman	L	R
Umatilla	L	R
Union	L	L
Wallowa	M	L
Wasco	L	L
Wheeler	M	L

Abundance: A = Absent, R = Rare, L = Low, M = Moderate, H = High